

DIFFERENT PRE-TREATMENTS AND STORAGE STABILITY OF DEHYDRATED PINEAPPLE SLICES

SANJEEV KUMAR¹ & R.N. SHUKLA²

¹Ph.D (APFE) Department of Food Process Engineering, VIAET, SHUATS Allahabad, Uttar Pradesh, India

²Department of Food Process Engineering, VIAET, SHUATS Allahabad - Uttar Pradesh, India

ABSTRACT

The preservation of food is very difficult for sustaining the global food supply but it could be improved through various productions and processing technologies. These technologies are helpful to improve the quality, quantity and public health standards of food products while preserving the environment and fulfilling consumer expectations. Fruits or food drying is one of the simple processes that require much time and higher cost in food processing. To reducing the time of drying and consequently its cost, Pre-treatments are used. In the past years, many authors had studied the use of various pre-treatments to induce structural changes in the fruit tissue as to improve the effective water diffusivity during drying and consequently reduce drying time. After drying, techniques used for packaging of the food are most effective to preserve the food. In this paper we are going to research on the different types of pre-treatment used in the drying of the pineapple with different drying methods and after that proposed a research for the combination of the pre treatment, drying method and packaging technology to preserve the quality and sensory value of the pineapple for long time.

KEYWORDS: Pineapple, Solar Dryer, Cabinet Dryer, Microwave Dryer, Hurdle Technology, Osmotic Dehydration, Infrared Drying & Gamma Radiation

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INTRODUCTION

The time of acceptability of harvested fruits is reduced due to microbiological and chemical changes and it is not safe for consumption after some time. So various methods of food preservation are used to prolong the length of time for which the fruit retains quality and appeal. Due to respiration, onset or progression of ripening, water loss, enzymatic discoloration of cut surfaces, decay, senescence and mechanical damage suffered during preparation, shipping, handling and processing the post harvest quality of fruits loosed. Maintaining the quality of a dried fruit or vegetable product is a major concern and a priority in the development and production of dried products of the industry. The different food industries have been searching for other alternative methods to increasing of shelf life of dried product from decay. Both consumers and food producers require more research about dried produce. In the same manner, consumers want quality low priced dried produce. Food scientists attempt to solve problems in dried processing and quality preservation to fulfill this need. It is found that the use of natural products and their derivatives have been reducing the decay of quality of many dried fruits and vegetables. These antaging agents such as ascorbic acid, N-acetylcysteine, 4-hexylresorcinol, isoascorbic acid, calcium chloride, potassium sorbate and propionate, were alone or in combination with them at different level of concentrations, have been taken to be effective in retarding browning and reducing decay of dried. The effects of such treatments have not been reported in maintaining quality of dried pineapple. In an attempt to preserve quality of dried pineapple by reducing browning and decay, treatments with antibrowning compounds in conjunction with the passive modification of vacuumed packaging would be evaluated. Their valuable effects on the reduction of browning,

modification of texture and other quality attributes as well as microbial decay will be studied [1, 2, 27].

Dried produce is one of the fastest growing convenience food industries in history. Dried fruits and other foods were offered a number of advantages over whole product, including price control, reduction of waste, variety selection, consistent quality and safety, and less in-store labour. Consumers are able to buy smaller portions of the fruit needed at lower prices, thus save money and prevent waste on leftovers. It is more convenient for consumers to buy two or more varieties of cut fruits at a time compared to whole fruits.[4,5,10] Processing and packaging is done under the same conditions therefore consistent quality and safety is always assured. There has been increasing demand for various dried tropical fruits over the years. However, their short shelf-life has limited their market increase. Quality changes with respect to firmness, colour, total soluble solids (TSS), titratable acidity (TA), sensory quality and microbial safety of dried mangoes, melons and mixes of these fruits have been found to be improved upon by pre-heat treatment [8,25, 33].

Drying is the most common method of food preservation. To reduce the degradation of the fruit, drying by air is generally performed at mild temperatures (between 40°C to 70°C). This process runs from 7 to 25 hours depending on the moisture level of fruit. The temperature of dryer is maintained by direct contact of the air passing through the samples. To reduce air-drying time a pretreatment could be initiated. There are many methods present for pre-treatment that can be reduced the time of air-drying. These methods of pre treatment could be change the chemical, mechanical or physical properties of product [26, 29]. The rate of cavitations or alternate compressions and expansions depend on the pre treatment. The different changes effected of acoustic pre treatment and it could be used to improve many processes such as mass transfer and drying. The pre treatment was man cause to generate sponge effect which could create microscopic channels for moisture removal. These channels could be used by water molecules to increasing its effective water diffusivity. The pre treatments are also increase the convective mass transfer and reduce the diffusion boundary layer in the fruit sample. For the removal of moisture strongly, the cavitations produced by pre treatment are beneficial attached [18, 22, 32].

Pineapples are good source of manganese as well Vitamin C and Vitamin B1. Due to their fibrous nature, pineapples help prevent intestinal disorders and act as natural anti-inflammatory agent with analgesic properties (Monzon, 1995). The ripe pineapple is a delicious diuretic which destroys intestinal worms and soothes bile. It is beneficial to the heart and effective in abdominal disorders, jaundice and anemia. Fresh pineapple juice exercises a soothing effect on the throat and is very useful in preventing infections of the vocal organ. It also gives relief in cellulites. It contains bromelain which has anticoagulant and anti-inflammatory properties. It has also been proved to enhance the effect of some antibiotics amoxicillin, erythromycin and penicillin [12, 27, 30].

In this research we are going to find out different types of the pre treatment, drying methods and packaging of the dried fruits. By this research, we will be also find out the best combination of the pre treatment, drying method and packaging and the different processes to checking the quality and shelf life of the dried pineapples.

HISTORICAL BACKGROUND

The pineapple was first of all discovered by Dutch in 1493 on the Caribbean island that came to be known as Guadalupe. Due to the ability to flourish in tropical region, fruit's needed tropical climate. By the end of the 16th century, Spanish and Portuguese explorers introduced pineapples into many tropical countries of east glob in which the pineapple is still being grown today. Pineapple fruit undergo rapid browning as a result of cellular disruption and access to oxygen

during the operations prior to canning; the browning reaction is mainly caused by the enzymes polyphenol oxidase acting on a suitable phenolic substrate in the presence of oxygen (Joslyn and Pointing, 1951). These changes are controlled either by heat (blanching) or by chemical inhibition. Steam at 93°C or higher is used to give a rapid blanch (Tate, et al., 1964). Begum, et al., (1983) tried pineapple and mango pulp mixtures in the ratio of 25:75, 50:50 and 75:25 for preparation of squash and they have claimed good consumer's with pink berries grape cultivar beauty seedless and observed that the addition of grape berries have resulted mixed jam rich in all the factors, however organoleptic rating showed, pure jam had high acceptability over mixed jam. Begum, et al., (1983) tried pineapple and mango pulp mixtures in the ratio of 25:75, 50:50 and 75:25 for preparation of squash and they have claimed good consumer's acceptance. Bhatnagar et al., (1984) reported similar findings with muskmelon mixed jam and observed that mixed jam had high optical density values as compared to pure jam throughout the storage period might be attributable to enzymatic browning. Further increase referred as non-enzymatic browning resulting into the formation of brown pigments. Sslvaraj *et al.*, 1999 conducted a study of the physicochemical properties of pineapple (cv. Kew) fruits harvested at various dates during the winter (115-120, 135-140, 141-145, 146-150, 151-155 or 156-160 days from flowering to harvesting or DFH) were studied. Several experimental studies on the drying characteristics of pineapple products have been conducted such as pineapple slices (Sacilik and Elicin, 2006; Nowak and Lewicki, 2004; Ramaswamy and van Nieuwenhuijzen, 2002; Karathanos et al., 1995; Uretir, 1995; Akpinar et al., 2003), apple cubes (Lewicki and Korezak, 1996; Uretir et al., 1996), apple puree (Bains et al., 1989), cylindrical shaped apple lump (Andrés et al., 2004), and rectangular shaped apple lump (Velic et al., 2004). Bell *et al.*, (1990) and Majumdar *et al.*, (2000) studied Freeze-drying and stated that the drying processes are numerous because it is one of the most common industrial operations and involve high energy consumption, 10-25% of the total energy used in manufacturing processes worldwide.

Ratti (2001) mentioned that pineapple is highly perishable due to its high moisture content, and most proposed uses require dehydration as a pre-treatment. In addition, dehydration is an approach to extend shelf-life and minimize handling costs for further processing. However, drying causes physical, chemical, and biological changes, especially to natural nutrients and bioactive compounds that are unstable to heat. Bains et al., (1989), Andres *et al.*, (2004) Sacilik and Elicin, (2006), studied on the drying characteristics of pineapple products have been conducted such as apple slices, apple cubes, apple puree cylindrical shaped apple lump, and rectangular shaped apple lump. Bhandari (2005) and Gharsallaoui *et al.*, (2007) studied on Spray-drying and stated that it was a unit operation by which the atomized liquid product passes through hot gas currents to instantaneously become a powder. Air or inert gas such as nitrogen is usually used for gas. A solution, an emulsion or a suspension can be used for the sprayer. Henriquez *et al.*, (2010) showed that thermally processed foods, especially fruits and vegetables, have a higher biological activity due to their various chemical changes during heat treatment when compared to food at its freshest state. Cil *et al.*, (2010) stated that drying required substantial thermal energy and this is often obtained from the combustion fossil fuels. Thus drying can have both an economic and environmental impact. Thermal dehydration industries contribute 12-25% of energy consumption in industrial nations. Cil *et al.*, (2010) studied on microwave drying stated that in general, a complete microwave drying process consists of three drying periods. In the first period which is a heating-up process, while the temperature of the product increases with time, microwave energy is converted into thermal energy within moist materials. Once the moisture vapour pressure in food is above that of the in environment the material starts to lose moisture. Aandres *et al.*, (2004) Sacilik and Elicin, (2006), Bains et. Al. (1989), studied on the drying characteristics of apple products have been conducted such as apple slices, apple cubes, apple puree cylindrical shaped apple lump, and rectangular shaped apple lump. Prothon *et al.*, (2001) studied that

the major effect of microwave air-drying and compare it with or without osmotic pre treatment on pineapple. The drying of pineapple had done by microwave-assisted air-dehydration at different temperatures (50, 60 and 70 °C) with the help of osmotic pre-treatment in sucrose solution. These samples were compared to the control samples that did not undergo any pre-treatment. Findings showed that osmotic pre-treated samples overall quality were increased. Although the drying time and the drying rate during the microwave finish-drying was reduced due to pre-treatment. As per Giovanelli et al. (2002) in order to find out the drying kinetics of tomato slices the physiochemical parameters such as colour retention, water activity, dehydration capacity and ascorbic acid retention can be evaluated. The studies carried out by IIHR (2010) suggested that process has been standardized for preparation of osmotically dehydrated pineapple slices. Organoleptically, slices were acceptable to highly acceptable category mainly due to the improvement in product quality in terms of colour, texture and flavor by processes of osmotic dehydration. This process has a greater scope for utilization of pineapple fruits. Aguilar *et al.*, (2004) studied that the physiological responses of pineapple slices. Slices of pineapple were immersed for 2 min in pre treatment solution (isoascorbic acid (IAA) 0.1 mol/l, ascorbic acid (AA) 0.05 mol/l or acetyl cysteine (AC) 0.05 mol/l), and packaged for storage for up to 14 days at 10°C in polystyrene trays, prior. These anti browning agents were used to reduced browning and decay of pineapple slices significantly. The pre treatments were also reduced changes in b_* and L^* values as well as different losses. The study by Roberts et al (2006) indicated that both the length of shelf life and type of spoilage were related to fruit species. Minimally processed fruit had longer shelf life at 4°C than at temperature recommended for whole fruit when there were greater than 4°C. Spoilage of 4°C-stored kiwi fruit, papaya and pineapple pieces were not a consequence of microbial growth. The sensory analysis carried out by Harper et al. (2006) showed slight difference between fresh and MAP mango and no difference between fresh and modified atmosphere packaging pineapple. Modified atmosphere packaging could be used as a technology to extend the shelf life of mango and pineapple. Karim (2010) proposed the comparison of different pre-treatment methods and different drying temperature and drying time (80°C/8 h, 70°C/10 h and 50°C/16 h). Authors stored the samples for 18 weeks and different parameters were analysed at every three weeks. The results obtained from the experiments found significant effects of the pre-treatments on the moisture content of the dried pineapple slices. The 60% SO₂ at 70°C/10 h had the least value of moisture content of 8.75%. The results also found that drying at 70°C/10 h is more useful for drying of pineapple slices than other drying conditions. There was continuous reduction in moisture content was found during the early weeks of storage. However, the moisture content of the samples increased after 9 weeks of storage. Abano and Samamoah (2011) studied that the effects on the drying characteristics of the ripe Gros Michel banana slices by different pre treatments and temperature. The slices of bananas were pre treated with four different methods such as ascorbic acid, lemon juice, salt solution, honey dip and a control. The drying time was used for 10 minutes and each replicated three times. A cabinet oven dryer was used for Pre-treated banana slices for drying at 60°C and 70 °C and their different drying characteristics (rate of drying, moisture diffusivity, re-hydration ratio, and coefficient of re-hydration) were observed. The percentage of moisture of the fresh ripe bananas for control and pre-treated samples was found to be in the range of 75-77 % (w b) which was reduced to 16.8 to 27% after drying of 16 hours. The moisture diffusivity varied from 7.89×10^{-5} to 14.94×10^{-5} m/s², during oven drying and it was increased when drying air temperature was increased. The banana slices dried better than the others and resulted in about 13% savings in time when at a drying air temperature of 70°C. The maximum and minimum re-hydration ratio was observed as 1.716 and 1.215 respectively for slices treated with lemon juice and ascorbic acid samples. Karunarathna and Rathnayaka (2012) studied the effect of osmotic agents consisting of glucose solutions on the drying of pineapple slices at 50° C temperature and incorporated with 0, 1, and 2 % calcium lactate. The effect of osmotic dehydration was analyzed on

properties and quality of pineapple slices during the storage for 28 days at 10 °C. Pre-Treatment by calcium lactate has been found useful for pineapple drying and gave good firmness and high quality. Manafzadeh *et al.*, (2013) studied the effect on shelf life by certain factors by considering the exposure to sun light and heat, they was also considered the transmission of gases, mechanical stresses, and strain by different micro-organisms of pre-treatment (Wardlaw, 2003). Major factors which was affecting on the quality of fresh-cut fruit were studied by different authors in which Kim *et al.*, 1993; Romig, 1995 and (Romig, 1995 were studied pre-harvest cultural practices; Gorny *et al.*, 1998 had studied on harvest maturity, physiological status of the raw product was studied by Brecht, 1995, while postharvest handling and storage had studied by Watada *et al.*, 1996, processing technique had syudied by Saltveit, 1997; Wright and Kader, 1997, Hurst, 1995 had studied on sanitation, packaging had studied by Solomos, 1994; Cameron *et al.*, 1995 and Brecht, 1999 had measured the temperature management during marketing). Karim *et al.*(2008) studied on the Effect of Pretreatments on Quality Attributes of Air-Dehydrated Pineapple Slices and found that the pre-treatments had given a significant effect on the moisture percentage, pH value, TTA and ascorbic acid of the samples before drying. The percentage of moisture reduced from 82.41% of fresh pineapple to 80.53% by SO₂ solution while the 60% sucrose sample had a reduction to 81.70%.

Saxena *et al.* (2009) studied on the pineapple slices using advanced hurdle technology. The shelf life of the pineapple slices was found to be 40 days at room temperature (26 ± 2 °C). The control sample was spoiled within 6 days. The RTE pineapple slices were found to have good texture, colour and sensory acceptability, during this 40 days storage. Ediriweera *et al.* (2012) said that the chemical pre-treatment's have not significantly affected the physicochemical and microbiological properties of pineapple at day first day or after on seventh day storage period. So, all final products could be considered as safe for consume. But, after seven days, the flavor of pineapple treated with 1% sodium chloride or a combination of 1% sodium chloride and 1% calcium chloride was found to be higher than that in the control and other chemical treatments. Thus, it is recommended to use either 1% sodium chloride or a combination of 1% sodium chloride and 1% calcium chloride if processed pineapple is stored for seven days. Swain *et al.* (2013) studied on the Effect of Packaging Materials on Quality Characteristics of Osmotically Pretreated Microwave Assisted Dried pineapple. The samples were taken for storage and for this, they heat sealed and packaged in Laminated Aluminum (Al), polypropylene (PP), and High density polyethylene (HDPE). After that, these samples were stored at room atmosphere for 4 months and at every ten days, the quality parameters such as total color difference (TCD), browning index (BI), moisture content (MC), water activity (Aw), total carotenoid (Tc) and Sensory Score (SS) were measured. The result found that the packaging materials had significant effect on the shelf life of the pineapple while sensory score was unaffected. The effect of ambient environment on Laminated Aluminum (Al) was least and followed by HDPE and PP showed low water vapor transmission rate (WVTR).

Masamba (2013) studied on the evaluation of sensory quality attributes and extent of vitamin C degradation in dried fruit pieces pre –treated. Different parameters such as Vitamin C and pH values was measured before and after drying and sensory quality such as flavor, color, texture and taste was evaluated using 9 scale panel. The observation found that the use of different pre-treatments had decreased the vitamin C degradation and registering the highest reduction in the samples.

PROPOSED METHODOLOGY

After the survey on the different research on the field of the drying and storage of the pineapple for increasing it's shelf life, we proposed a research with given objectives and hypothesis. Our main objectives are to study the effect of the

different pre-treatments on the quality of pineapple slices during drying and storage which was dehydrated by tray dryer and microwave power. We will be also study the effect of different packaging materials on physio-chemical quality of dehydrated pineapple slices during storage and also study the effect of microbial characteristics of tray dryer and microwave power dehydrated pineapple slices during storage.

Our Hypotheses are given below

H1: Pre treatment of the pineapple slices by Ascorbic Acid/Citric Acid Dips can reduce energy consumption and also improve the quality of the dried pineapple.

H2: Electric power operated tray dryer and microwave dryer can reduced the drying time and nutritive value of the pineapple should be unaffected by microwave dryer

H3: the quality of the dried pineapple may improve by pretreated microwave drying

H4: the shelf life of the pretreated dried and packed pineapple should be improved and the quality of the material would remain for long time.

H5: Transportation and packaging cost of the pineapple fruits will be reduced after dehydration.

Drying Characteristics

- **Drying Rate (By Ranganna, 1986)**

The Drying rate is measured the rate of present of moisture percentage content from the sample. This was mathematically calculated by different formulas.

$$\text{Present moisture content} = (\text{Loss in weight}) / (\text{Initial Weight of the sample}) \times 100 \quad (1)$$

$$\text{Moisture content(Dry basis)} = (\text{M. C. (wet basis)}) / (100 - \text{M. C. (wet basis)}) \times 100 \quad (2)$$

$$\text{Moisture content(M. C.)(wet basis)} = (M_1 - M_2) / (M_1) \times 100 \quad (3)$$

$$\text{MC(lost)} = (\text{M. C. (current)} - \text{M. C. (previous)}) \quad (4)$$

$$\text{Rate of drying} = (\text{MC(lost)}) / (\text{time difference}) \times 100 \quad (5)$$

M.C. = moisture content of the sample (% w.b. and d. b.)

M_1 = wt. of the sample before solar dryer (g).

M_2 = wt. of the sample after solar dryer (g).

- **Dehydration Ratio (By Ranganna, 1986)**

Dehydration ratio is an important factor, which shown bulk reduced in weight of the sample. Moist the dehydration ratio better the process of drying. Formula used for calculating dehydration ratio is:

$$\text{Dehydration ratio} = \frac{(\text{Initial weight of the product})}{(\text{Weight of dehydration product})} \quad (6)$$

- **Rehydration Ratio (By Ranganna, 1986)**

Rehydration ratio is one of the important bases to form a base material for further utilization. Rehydration is the replace of water in development food. Fruit are rehydration to study the reconstitute of dried sample. Rehydration ratio show the originality grained and acceptability attribute of a product (Ranganna 1986).

$$\text{Rehydration ratio} = \frac{(\text{Weight of the soaked product } (W_r))}{(\text{Weight of dehydration product } (W_d))} \quad (7)$$

Where,

W r = weight of the soaked product.

W d = weight of the dehydration product.

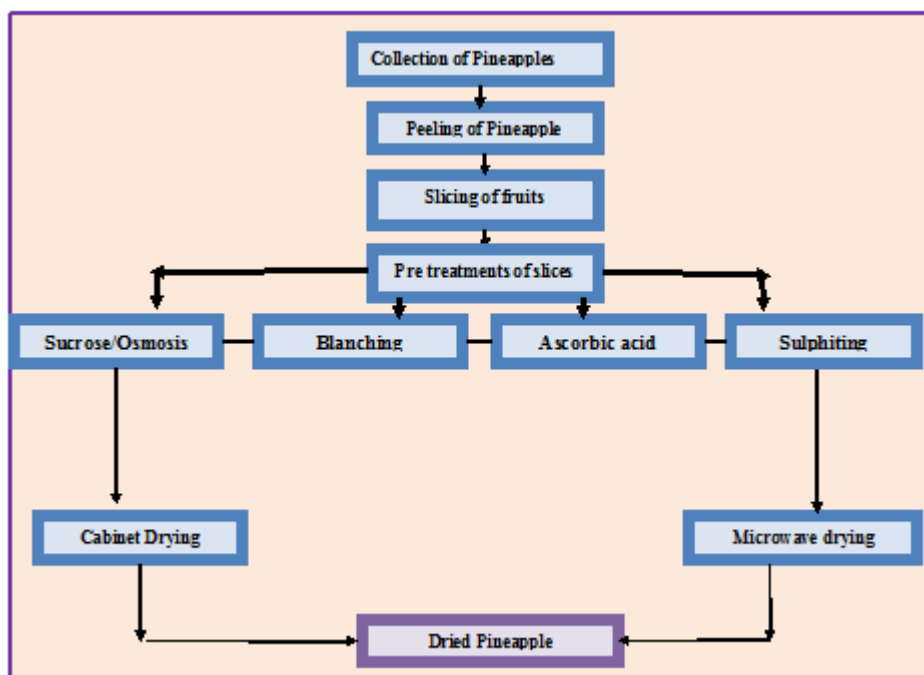


Figure 1: Process Flow Chart of Pineapple Drying

Physiochemical Analysis

- **Moisture Content of Pomace Powder (By Ranganna, 1986)**

It will be analyzed in Hot air oven at 103C and will be calculated by formula

$$M. C. = \frac{(\text{Wt.of the sample at desired time}) - (\text{wt.of bone dry material})}{(\text{Wt.of sample at any time})} \times 100 \quad (8)$$

- **Determination of Ash Content By Muffle Furnace (By Ranganna, 1986)**

The ash of the food stuff is the organic residue remaining after the organic matter has been burnt away. When a high ash Figures found it suggests the presence of an adulterant, it is often advisable to determine the acid insoluble ash also.

$$\text{Ash \%} = \frac{W_2 - W_1}{W} \times 100 \quad (9)$$

Where,

W_2 = Final weight of dish + Ash

W_1 = Weight of dish

W = Weight of sample

- **Percentage of Acidity (By Ranganna, 1986)**

For the measurement of first of all a 10 ml samples were taking a from each prepared filtrate which was diluted with 20 ml distilled water. Now this was titrated against 0.1 M NaOH with phenolphthalein as the indicator of pH value.

The value of TA was calculated by multiplying the volume of NaOH with the dilution factor with the citric acid factor (citric acid factor = 0.0064 g). TA was expressed as percentage citric acid.

- **Total Solids Solubility (TSS) (By Ranganna, 1986)**

The actual TSS content was calculated by multiplying each reading with the dilution factor (Abeywickrama *et al.*, 2004).

- **pH Value (By Ranganna, 1986)**

pH of the filtrates was measured using a Digital pH meter (Hanna Instruments, Portugal).

- **Determination of Ascorbic Acid (Vitamin C)**

Ascorbic acid otherwise known as vitamin C will be determined by dye method (chinchu *et al* 2013). The reagents used will 4% oxalic acid, standard ascorbic acid solution in 4% oxalic acid and dye solution (42 mg of sodium bicarbonate and 52 mg of 2,6, dichloro phenol indophenol dye in 200 ml of distilled water). About 100 mg of pure dry crystalline ascorbic acid will be taken and made up to 100 ml using 4% oxalic acid to get the stock solution. The working standard solution (100 ml) will be prepared by diluting 10 ml stock solution using 4% oxalic acid. About 5 ml each of working standard solution and 4% oxalic acid will be pipetted into a conical flask and titrated against the dye solution. End points will the appearance of pale pink colour which persisted for a few minutes. The titration will be repeated for 3 times to get the concordant value. The amount of dye consumed (V_1) will be determined which will be equal to the amount of ascorbic acid present in the working standard solution. Then the sample will made into powder and 10 ml of the homogenized pulp (V_s) will be taken and made up to 100 ml with 4% oxalic acid solution. Then 5 ml of the made up solution will be pipetted out into a conical flask and titrated against the dye (V_2). The quantity of ascorbic acid (mg) present in 100 gm of sample will be calculated as follows.

$$\text{Ascorbic acid (mg/100g)} = \left(\frac{0.5}{v_1}\right) * \left(\frac{v_2}{5}\right) * \left(\frac{100}{v_3}\right) * 100 \quad (10)$$

Determination of Microbiological Properties

The samples of pineapple removed for microbiological assessment on first day and 7th days after storage.

- **Total Plate Count**

20 g of pineapple was taken in a blender for 2 minutes and homogenized with sterile 0.9% NaCl (180.00 ml) and a dilution series was prepared up to 10^{-5} . One millilitre aliquots from 10^{-3} , 10^{-4} and 10^{-5} were taken with 12 millilitre of molten PCA in duplicate, incubated at 28 ± 2 °C for 72 hours and the number of bacterial colonies was counted.

- **Determination of Yeast and Mould Count**

One ml aliquots from above 10^{-3} , 10^{-4} and 10^{-5} dilutions which were used for enumerating total aerobic plate count were separately plated along with 12 ml of molten yeast and mould agar (YMA) in duplicate. Plates were incubated at 28 ± 2 °C for 72 hours and CFU were determined (Aida *et al.*, 2007). Eight replicate samples were used per treatment

Sensory Properties

Samples of pineapple were taken for sensory evaluation on first day and 7th day by presenting for taste in randomly chosen 9 member taste panel along with a 7 scale questionnaire. Sensory evaluation for taste, odour, flavour, appearance, colour and overall acceptability was done using a 7 point ranking system.

CONCLUSIONS

After the review and analysis of the different research paper, it was found that there were many techniques used for the drying of the pineapple fruit pomace; in which two main dryers were used. First one was solar dryer techniques (sun drying, solar drying, tunnel drying etc.) and second one was electric dryer (cabinet dryer, microwave drying etc.). After the observation of the dryers it concluded that solar tunnel dryer (drying rate and quality was best among the solar dryer) while microwave dryer was best in the electric dryer. It was also observed that the physical and chemical attributes correlate with the sensory characteristics of the products, showing the impact of pre-treatment on the sensory characteristics. Also, the results of the sensory evaluation justify the acceptability of pre-treated/dehydrated pineapple slices. Consequently it could be concluded that combination of pre-treatments of: 60% sucrose/2500 ppm SO ; 40% sucrose/60°C blanching/2500 ppm SO ; 60°C blanching/ 2500 ppm SO would be suitable for production of dried pineapple slices with vacuumed packaging and this combination would be improve the shelf life of the pineapple slices. Hence our proposed methods for the improvement of the quality and shelf life during storage by microwave and cabinet dryer with different pre treatments and vacuumed packaging will be give better results than previous work.

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